Cuadernos de Economía. Vol. 16 287-307 1988.

Innovation, Enterpreneurship, and the Role of Small and Medium Size Industries.

Luis Suárez-Villa
Program in Social Ecology
University of California at Irvine
Irvine, California 92717
U.S.A.

Innovación, empresariado y el papel de la pequeña y mediana industrias.

RESUMEN

Este trabajo se centra en la importancia económica de la pequeña y mediana industrias en un contexto de cambio manufacturero y de largo plazo. Se destacan, desde una perspectiva histórica, cinco importantes innovaciones empresariales y se relacionan con su potencial aplicabilidad a las pequeñas y medianas empresas en distintas etapas de cambio industrial y económico. Se destaca la importancia de la dinámica del tamaño de la empresa en el desarrollo económico y se discute conceptualmente la relación entre el desarrollo de productos y procesos, el empresariado innovador y el papel de la pequeña y mediana industrias.

Innovation, Enterpreneurship, and the Role of Small and Medium Size Industries

ABSTRACT

This paper focuses on the significance of small and medium size industries in long term economic and manufacturing change. Five major innovative entrepreneurial roles are identified from the modern and historical economic literature, and are related to their potential availability in small and medium size firms over the various stages of economic and industrial change. A general analysis of the significance of firm size dynamics in economic development is the followed by a conceptual discussion on the relationship among between product and process development, innovative entrepreneurship, and the role of small and medium size industries.

Innovation, Enterpreneurship, and the Role of Small and Medium Size Industries.

I. Introduction

The rapid international diffusion of manufacturing activities and innovations has become one of the major economic characteristics of our time. Nations that had scarcely industrialized over three decades ago have now become major exporters of industrial goods where manufacturing makes a substantial contribution to national development.

Enterprise size has been one of the most significant variables influencing industrialization and the international diffusion of innovations. Small and medium size industrial enterprises have, in particular, been major vehicles for both employment creation and the diffusion of innovations at local and regional levels, especially in less developed economies. In advanced nations, small and medium size enterprises have also played significant roles in the diffusion of innovations, especially in the earlier phases of product and process development.

The relationship between enterpreneurship and firm size in promoting these developments has been neither adequately acknowledged nor researched. Usually, both entrepreneurship and firm size have treated in highly fragmented ways to focus on such aspects as investment, R & D, and internal organizational questions. While such studies have yielded very significant insights on the issues they have researched, the broader aspects related to the various enterpreneurial roles and their relationship to firm size and evolution have been conspicuously missing.

This paper will attempt to relate the broader and most significant aspects of entrepreneurial innovation and its diffusion by considering the role of small and medium size industrial enterprises in product and process development. A concise survey of the historical literature will first define the major innovative entrepreneurial roles, to be followed by a brief discussion of the role of small and medium size industries in the process of industrialization and economic development. The relationship between the entrepreneurial roles, innovation diffusion, product and process development, and firm size will then be explored in the last section. Emphasis will be placed on examining the general relevance of these relationships and their microanalytic details or assembling empirical evidence.

II. Enterpreneurship and Innovation – A Broad Perspective

While technological innovation has attracted much attention in recent times, its relation to the broader and very significant question of entrepreneurship has remained considerably neglected in the economic literature. Such neglect has been one of the most pervasive features of the orthodox economic paradigm. An emphasis on unrealistic behavioral principles, compounded by Walrasian static analysis, and by equilibrium and optimization assumptions, have tended to view entrepreneurial activities as automatic, if not downright trivial[1]. This bias has also been significant in the economic development literature, where its "macro" approach, based on national income accounting, has all but completely ignored the role of entrepreneurship as the most important factor in development. To a great extent, this neglect has been part of the Keynesian legacy and its emphasis on economic aggregates[2]. At the same time, the study of economic development, whether macro or micro, has depended greatly on the study of flows, whereas entrepreneurship can only be considered, from this perspective, as a stock variable.

It is interesting to note that a recent survey of 25 general works on economic development, many of them textbooks, found that while several of them contained a section or chapter on entrepreneurship, the ideas developed in those sections were, for the most part, not applied in other chapters[3]. At the same time, their treatment of export promotion and industrialization policies has not considered the impact of shortfalls of entrepreneurial skills in the implementation of such strategies. This neglect has, for example, also become obvious in our prevailing ignorance of the obstacles and frictions that interfere with entrepreneurial oportunities. Institutional obstacles that arise both from divergent economic interests and established inertia have thus been important obstructions to economic growth and innovation. Obstacles related to a lack of skills and knowledge, along with the effort required to overcome the little noticed but important friction of space and distance, especially in international and interregional trade, have also been greatly ignored.

Clearly, a definition of entrepreneurship that focuses only on technological innovation is insufficient to consider the myriad other innova-

1. A significant discussion of the shortcomings, based on the neoclassical approach, is in Baumol (1968, 1983).

2. See, for example, Giersch's (1984) provocative account of the Schumpeterian paradigm and its relation to current and previous trends.

3. See Leibenstein (1985); the same pattern was found in discussions with economists who teach courses on economic development.

tive activities and roles that are part of the entrepreneurial function. Only when entrepreneurship is differentiated with respect to its various economic and innovative roles can it be expected to provide adequate insights on its effects on the processes of industrialization and economic change. At the same time, it is obvious that enterprise size has different impacts on, and is variously affected by, each entrepreneurial role. Larger firms may thus be able to afford entrepreneurial capabilities that are virtually unknown to smaller firms, while the latter can enjoy greater flexibility in making decisions that take better advantage of rapidly changing conditions.

Although a precise definition of entrepreneurial roles has not emerged, the historical literature on this topic has revealed diverse facets that can be used to develop a comprehensive typology[4]. Capital investment and accumulation, and the inherent risk involved, has been the oldest and most common role ascribed to entrepreneurship. This definition can be historically traced to Cantillon's eighteenth century conceptualization of the entrepreneur as the bearer of non-insurable risk. It became enshrined in economic thinking after Adam Smith's mercantilist interpretation of entrepreneurship as the provision and accumulation of capital, to the exclusion of other possible roles, a legacy that was later adopted and expanded upon by Marx and, in our own time, by the neoclassical paradigm. Almost half a century after Smith, Say provided a distinction between investment and organizational decision-making that was largely ignored for over a century, but would be made more explicit by Schumpeter's well-known differentiation between innovative and routine decision-making.

A second but less common role assigned to entrepreneurship is that of managerial or productive coordination. After Say's contribution, noted above, Marshall equated entrepreneurship to the coordinative role by regarding it as the fourth factor of production. Contrary to the opinion of some scholars, however, Schumpeter did not exclude the potential for innovation from this role, inasmuch as he regarded the development of new organizational forms to be a major component of the innovative process. This role was also related to the process of economic development when, in the 1950s, Harbison (1956) observed that managerial and organizational capability were the most scarce skills in less developed economies. Then, since the 1960s, the coordinative role has attracted significant attention through Leibenstein's (1968, 1978) X-efficiency conceptualization that focuses on organizational motiva-

4. Some discussion on the need to approach entrepreneurship from a broad, multidisciplinary perspective has emerged in the literature from time to time. See, for example, Giersch (1984), Kilby (1971), and Redlich (1966).

tion as a major factor in economic change[5]. The coordinative role becomes most obvious in the X-efficiency paradigm through the definition of "input completing" activities, where the ability to obtain and use factors of production that are not well marketed is most seriously tested. For such factors, markets may not even exist, and prices will not usually yield the necessary signals required to anticipate quality or performance levels. It is also in this role where small and medium-size industrial enterprises have been most effective in fulfilling economic needs. Such commonplace activities as the adaptation of production processes to allow the employment of less skilled labor, or the restructuring of production tasks to implement a new productive process, are familiar examples of this element.

The Scumpeterian focus on innovation attracted increasing attention to a third major component of the entrepreneurial function: invention. Schumpeter's (1934) implicit, yet well-known distinction between process and product innovation basically equated the latter to the type of experimentation and discovery that is now commonly associated with corporate R & D and individual inventiveness. Nelson and Winter (1982) have been the most recent and best-known exponents of this approach, focusing on one major and very significant aspect of invention: corporate R & D and its effects on economic change. Their extension and conceptualization of this aspect of innovation as an evolutionary process, rooted in natural selection mechanisms, have extended and enriched the Scumpeterian paradigm and its dynamic underpinnings[6].

A fourth major component of entrepreneurship that is much related to organizational form, structure and size is that of strategic planning and decision-making. This role can also be related to Schumpeter's broad perspective on innovation through the very direct effect it exercises on such activities as the creation and opening of new markets and sources of inputs. The evolution of this role can be traced to the historical development of industrial organizations as they changed from being primarily single product-single function enterprises to single product-multi function and finally multi product-multi function organizations. Its context is therefore much related to questions of enterprise size and to changes in managerial knowledge. Chandler and Redlich (1961) and Chandler and Daems (1980) have related this typology to the geographical expansion of markets of industrial enterprises as these evolved from serving primarily local or regional markets to multi-region and to

5. A major argument for this approach is based on Solow's (1957) finding of a substantial residual (87.5 percent), left unaccounted for by labor and capital in the production function specification.

6. See also Greenfield and Strickon (1981).

national and international markets. This role also has, in this sense, a substantial and explicit linkage to the international diffusion of entrepreneurial innovations through the decision processes it activates.

At a microbehavioral level, the strategic planning role can also be related to McClelland's (1961) elaboration of the "n-Achievement" (need for achievement) concept in its implications for risk-taking and decision-making. Because strategic decisions often affect substantially all of the other entrepreneurial roles, at least insofar as corporate organizations are concerned, its significance for entrepreneurial innovation and diffusion cannot be underestimated. More recently, Leibenstein's definition of "gap filling" activities in the X-efficiency paradigm is also central to this role, through the identification and coverage of market deficiencies and opportunities it exercises[7].

Finally, the connection of distinct markets is yet another role that has received substantial attention in modern times. Hirschman's (1958) contribution, viewing entrepreneurship as central to the creation of forward and backward linkages in manufacturing industries, was very significant in this respect. This view was also quite compatible with Schumpeter's perspective on the opening up of new markets or sources of inputs as major elements of innovation. Leibenstein (1978) has also expanded significantly on this role, considering it as a major outcome of entrepreneurial motivation in the X-efficiency paradigm.

III. Industrialization and the Role of Small and Medium Size Firms

A study of the significance of entrepreneurial innovation in the process of economic development cannot ignore the historical importance of firm size at any of the various stages of development. Previous work on industrial studies and economic development has shown that small and medium size industries (and particularly the former) have accounted for the larger share of manufacturing employment in most nations[8]. Only in some of those countries that are now in the most advanced stages of industrialization have large industries accounted for a significant share of industrial employment.

Small and medium size industries are, furthermore, more spatially dispersed and can make a better contribution to local and regional development, especially in hinterland regions, than large industries, which

7. Examples of "gap filling" provided by Leibenstein (1968) are the search, discovery and evaluation of economic opportunities and information, marshalling financial resources for the enterprise, and translating these into new markets.

8. See, for example, Staley and Morse (1965), Banerji (1978), and Anderson (1982).

are usually concentrated in primate or major metropolitan areas[9]. Small and medium size industries are also generally more labor intensive than large industries and can make a more significant contribution to both local and national employment, especially since they account for the lion's share of manufacturing employment. Most of the time, these industries have also served as significant incubators of large enterprise. In this respect, Anderson (1982), for example, found that the share in employment expansion of large industrial firms attributable to the growth of small industries ranged between 40 and 53 percent for Korea, the Philippines, Turkey and Taiwan, and was 67 and 70 percent for Indica and Colombia, respectively[10].

The relationship between firm size and the process of economic development has been previously explored by some authors through the analysis of historical stages of development. Thus, for example, Anderson (1982) and Parker (1979) developed general growth phase typologies based on the experience of the industrialized nations[11]. In these schemes, the contribution of industries becomes most obvious in the early phases of industrial development, where household (cottage) manufacturing can account for as much as 70-75 percent of total industrial employment (first phase, see Figure 1). Garment-makers, smiths, shoemakers, hadicrafts, and crop processing are typical examples of these industries. The predominance of these rudimentary industries in this stage is therefore best explained by their relationship to agricultural production, as providers of inputs and processing capacity, and of the non-food needs of rural areas and small towns.

Small workshops and factories have been found to grow rapidly and displace household manufacturing in many industries during the second stage of development. Over the long term, these firms have been generally considered to be a significant source of income. While many have thought small industrial firms to be engaged primarily in traditional activities, Norcliffe and Freeman (1980) have actually found that only a small range of such activities is actually practiced in many rural industries. A wider range of activities than has so far been thought possible in both rural (particularly resource-based and agro-processing) and urban "informal" small industries therefore attests to, and complements, the very significant employment share of these industries. Inso-

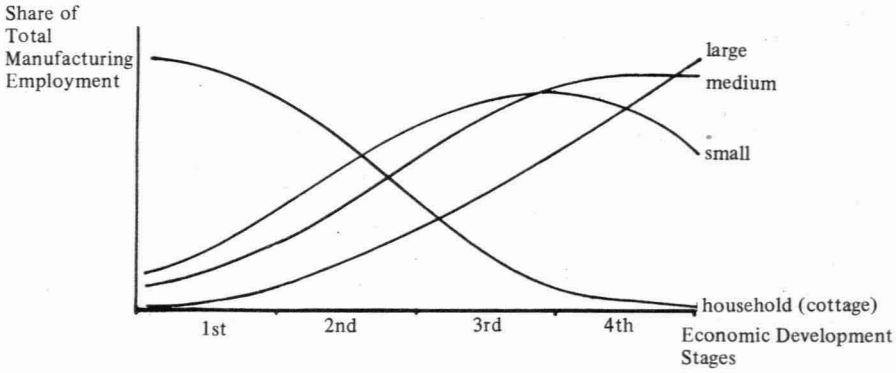
9. For the purposes of this discussion, small industry will be considered to include both household (or cottage) industries and small factories of workshops. Insofar as size thresholds are concerned, industries employing less than 30 employees are usually considered small; those employing between 30 and 100 are normally considered medium size while large industries are generally thought to employ over 100.

10. The time periods covered were 1920-40 (Taiwan), 1953-73 (Colombia), 1961-71 (India: Uttar Pradesh), 1963-75 (Korea), 1967-75 (Philippines), 1970-77 (Turkey).

11. See also Hoselitz (1959) and Livingstone (1980).

far as the entrepreneurial roles are concerned, it can be expected that productive coordination and intermarket connection may be most important for small household firms in these early stages. Investment capital is usually obtained from family or partners, and the role of institutionalized capital markets (except for some government-sponsored len-

Figure 1.– Manufacturing Enterprise Size and Development Stages



Source: Anderson (1982) and author's estimates

ding programs) is generally insignificant for these industries[12]. Similarly, invention and strategic planning are usually present only at a very rudimentary level, if at all. Some elementary technological experimentation can occur, however, through some equipment modernization and production readjustments. International innovation diffusion and adoption during the first two stages of development have been traditionally considered fo follow a simple pattern, originating in the advanced nations acting as global locomotives of economic growth and being diffused, with significant and varying time lags, to the less developed economies. In this process, primate cities and their most significant industries usually serve as major vehicles of diffusion to the hinterland and its lo-

12. Many have argued, over the years, for policy-induced shifts of investment opportunities toward these industries in less developed economies. Anderson (1982), for example, believes this would improve earning opportunities for a large share of the labor force while encouraging regional industrial development.

cal and regionally-based industries. Imitation effects can be considered to be very significant here, especially in the coordinative and intermarket connective entrepreneurial roles.

The growth of medium size industries is usually very significant during the second and third stages, but particularly the latter, as small industries grow and take advantage of greater scale economies in production, management, and technical efficiency. Better productive coordination, combined with improved access to investment capital and infrastructure and, in many cases, with government subsidies, are powerful causes and incentives for firms with sufficient entrepreneurial motivation to grow larger. At the same time, taking advantage of growing demand and a larger market niche also requires some strategic planning to guide firm expansion and marketing efforts.

The transition from household and small firms to medium size industries varies greatly between sectors. Anderson (1982) has, for example, found that small industries in light-engineering activities can grow very rapidly during this stage. Similarly, small and medium size clothing and footwear manufactureres can grow rapidly through "putting out", undertaken by many as a secondary source of income, and subcontracting. Small and some medium size producers in food processing can, on the other hand, decline significantly, as a result of the mechanization of processing operations for some agricultural products. Spatially, some urban "informal" small industries may grow while their rural counterparts decline. This is usually the case for small urban industries that increase thir workforce by providing employment to recent rural-urban migrants, or that act as low income, near-subsistence activities in the informal sector. At the same time, small and medium size metropolitan industries serving high income segments can also grow very rapidly, providing incomes that exceed the levels of skilled labor in the formal sector. Many of these small industries that grow to medium or even large size serve as convenient starting points for new entrepreneurs that want to reduce risks and overhead costs.

While the growth of large manufacturers is very conspicuous during both the third and fourth stages of development, it must be noted that these industries seldom account for a significant share of total manufacturing employment, except in the most advanced nations (fourth stage). At the same time, even the smaller industries of some sectors, such as electronics in the advanced nations, can be very significant in the latter stages as sources of invention. Household and small industries have also served a very significant role in many economies during these later stages, as substantial "putting out" and subcontracting can help isolate larger firms from the effects of major economic downturns and labor strife.

Industrial innovation can become most significant in the advanced nations in the third and fourth phases, and especially the latter, as substantial R & D investments and organization are developed. In the less developed nations, innovation absorption and imitation can attain unprecedented levels, through the establishment of capital goods industries and foreign-owned subsidiaries. For small and medium size firms, the development of infrastructure and communications that this implies can produce substantial advantages, including the opportunity to serve larger markets and attain larger threshold size. At the same time, these industries can also serve as significant vehicles of innovation diffusion in hinterland areas by increasing productivity and aggregate income.

The rapid growth of small and medium size industries over long periods in the second and third phases can best be explained by their spatial market dispersion, due to the lack of adequate infrastructure and the resulting high transport and marketing costs. Anderson (1982) notes that small industries benefitting from this condition are those processing a spatially dispersed raw material where transport costs can be lowered through weight reduction, those producing heavy, bulky, or perishable products, and the service or repair industries. In most cases, large industries located in the primate or major cities are unable to compete with these firms because, in addition to inadequate infrasture, the establishment of branch operations in the hinterland requires substantial capital investment, knowledge of local markets, and the training of local labor.

The rapid growth of small and medium size industries in these stages can also be attributed to an increase in the amount of subcontracting and local assembly in such activities as forging, foundry work, machine shop processing, and agricultural equipment manufacturing. Subcontracting has, in particular, been found to improve capacity utilization while it helps larger firms avoid labor problems during economic recessions, and the payment of uniformly high union wages in all or most stages of the production process. Low scale economies found in the production of differentiated products, sometimes also serving limited local markets, have also contributed in many cases to rapid small and medium size firm growth. The tailoring and garmet industries, specialty foods manufacturers, and handicrafts are examples of industries benefitting from this situation.

IV. Industrial Evolution, Innovation, and Firm Size

A better understanding of the process of change in enterprise size and its potential economic impact can best be obtained by focusing on

the patterns of product and process development that condition the firm's existence and its utilization of the entrepreneurial roles. It should be obvious from the preceding discussion that, while certain industrial firm sizes are predominant in each stage of development, individual changes in firm size are better related to the dynamics of product and process change that are, in turn, conditioned by innovative entrepreneurship and external demand conditions.

Product and process innovation and development have become the means through which firm sizes change and make their impact on local and regional economies. Quantum improvements in communications infrastructure and information technology have helped diffuse many advances to even the smallest producers, thereby accelerating the pace of difussion and innovation adoption in many nations. At the same time, advances in organizational practices and the fragmentation of production processes have helped the growth of small and medium size firms by making them more capable of being integrated in the international division of labor in manufacturing.

Product innovation and development have been conceptualized as life cycle-type phenomena with district phases of invention, growth, maturity, and decline[13]. While demand-side preferences have been found to be crucial in determining the life cycle span of a product, the degree of patent protection afforded by institutional mechanisms and the amount of investment devoted to invention and research have also been found to be very significant. In contrast, in process innovation, Nelson (1984) found secrecy rather than patent protection to be more important in preserving appropriability and limiting adoption and imitation. At the same time, the complex nature of process innovations makes them harder to decipher than product innovations, where advances are usually embodied and can be more easily analyzed and imitated. Product innovation may therefore more easily benefit smaller and medium size industries than process innovations, where substantial resources may be required for innovation or imitation.

In a life cycle model of product innovation and development, some entrepreneurial roles may be expected to be more significant than others in the various phases of change (see Table 1). A look at entrepreneurial performance through the various functions of an enterprise would, for example, reveal individual or corporate inventiveness to be a crucial role during the first phase of product development. Risk-taking is an essential element of this phase, and its degree of success will determine whether a new product will be marketed at all. An invention that results in a patent may notnecessarily translate into a new product, ho-

13. See Vernon (1966, 1970) and Hirsch (1967).

wever, as investment and marketing capabilities do not always follow automatically. More often than not, inventions that are patented are never developed because the follow-up entrepreneurial roles required are not available, or because substantial investment in products that accomphish a similar function has already been made. This is especially applicable to smaller firms lacking the necessary resources for subsequent investment. Also, although corporate R & D does account for the majority of product innovations, the role of small businesses has been important in some industries, such as electronic computing[14].

The investment and strategic planning roles are then essential during the subsequent phase of initial production, where meeting the rapid growth in demand and productive capacity is crucial to maintain appropriability and the benefits of a headstart. It is also in this phase where smaller firms have a significant opportunity to grow to medium or large size, through rapid market expansion. Strategic planning capabilities will therefore be especially important to the smaller and medium size firms in developing marketing strategies to take advantage of opoortunities. Well developed capital markets can be essential to these firms in channeling investment in this phase, and can help some of the smaller firms to grow substantially. Also, as competition begins to develop, smaller and medium size firms located in relatively lower wage regions may derive significant advantages over their metropolitan competitors, especially in the advanced nations.

Table 1.– Enterpreneurship and Product Innovation and Development

	Phases			
	I	II	III	IV
R & D	Invention (individual/ corporate)			
Finance		Investment		
Marketing		Strategic Planning		(Strategic Planning)
Production			Coordination	Coordination

14. See Jewkes *et al.* (1969) and Nelsol (1981).

Productive coordination is a significant entrepreneurial role in the mature and declining phases (III-IV) of the product cycle (see Table 1). The adaptation of productive processes to accommodate less skilled labor or greater automation, often combined with significant difficulties in labor-management relations, are a major challenge. Competitive pressures usually act as major catalysts of this role, as firms strive to adjust and survive relative product obsolescence. A tendency in the literature to think of this role as being merely "routine" is quite unjustified, however. At a microbehavioral level, the possibilities for innovative behavior, on the part of both labor and management, are usually not as limited as some would think, if the proper incentives and motivation exist. It is also during the mature phase that significant subcontracting to smaller and medium size firms can occur as a means of reducing uncertainty and the negative effects of economic downturns. Significant diffusion of production toward less developed regions usually occurs in this phase, through branch plant creation and the growth of small and medium size enterprises in those regions[15].

Significant differences in patterns of product decline during the last phase of product development have been documented in the management literature. The demise of a product may, in this sense, be as much due to innovations that render it less effective as to changing exogenous conditions that require a different application. Increasing competition may actually cause many industrial firms to shrink in size, as efforts to reduce costs occur and some operations are subcontracted out or transferred to lower wage regions or nations. At the same time, opportunities for product differentiation also exist, especially in oliogopolized industries where resources for innovation are likely to be available only to the existing corporate groups. Whenever product differentiation occurs, the strategic planning role becomes essential again, though not a crucially as in the second phase, as possibilities for significant market expansion are usually more limited. Even in oligopolized industries, however, product differentiation can be expected to help small and medium size firms through vertical disintegration and the resulting trend toward subcontracting.

These patterns of product change are underlain by a concurrent though different temporal dinamic in the processes that are applied to manufacture any given product. A process' life cycle may therefore be assumed to span over several phases of process innovation and development and encompass one or more product cycles (see Table 2 and Figure 2)[16]. Process innovations have been traditionally considered under

15. See, for example, Hansen (1979) and Thomas (1975).

16. See, for example, Abernathy and Townsend (1975), Hayes and Wheelwright (1979), and Suarez-Villa (1984, 1985, 1986).

the general rubric of "technology", but a review of the various entrepreneurial roles involved in process life cycles should reveal many other opportunities for innovation. The design of organizational structures to accommodate a new productive process or to make it work more effectively is one such example. This, and the fact that process development often requires new ways of making decisions, planning corporate activities, facilitating investment or a new process' access to capital markets, requires a much broader definition of innovation than is afforded by the usually narrow visions of technological invention. Also, technological invention itself often requires new modes of self-organitzation on the part of individuals and units searching for ideas and new combinations. Similarly, such "micro" yet significant innovations as developing new negotiating strategies to acquire or merge with other firms to achieve greater vertical or horizontal integration, devising new forms of work organization, supervision, and workforce participation in quality control, are usually ignored by the orthodox focus on "technology" as the source of process innovation.

Process innovations must therefore be thought of in broader terms than product innovations, since they often represent whole "new ways of doing things" that are complex and cannot be embodied in any given product or commodity[17]. Such new approaches can often be better structured in newer and smaller firms where set ways and complex bureaucracies do not become obstacles to creative exploration. Also, the revolutionary implications that such innovations have for the structure of any economy as well as for many "micro" aspects related to the workplace, to managing and investing, among others, cannot be ignored. Many process inventions today occur through medium size and large corporate actors, and this role can therefore be most closely associated with the modern corporate R & D function.

As with the product cycle, and for very similar reasons, the strategic planning and investment roles are crucial during the second phase of the process cycle. Innovative strategic planning can, however, be expected to include a broader range of activities, with deeper implications for medium and long term firm survival, than with product innovation and development. This can include all the logistics of planning the various product lines to be generated and the markets to be targeted, deciding on the geographical distribution of branch operations or subsidiaries and the division of labor of each within the firm's scope of activities,

17. The advantage of a headstart, especially in semiconductors, computers, and aerospace manufacturing, and advancing down the learning curve, have been found by Nelson (1984) to be most important in preserving appropriability for both process and product innovations. In semiconductors and computers, at least initially, the contribution of small firms has been very significant.

and promoting the firm's abilities to marshall and manage financial resources. This phase is therefore especially crucial for small and medium size firms hoping to grow and acquire a larger product market share.

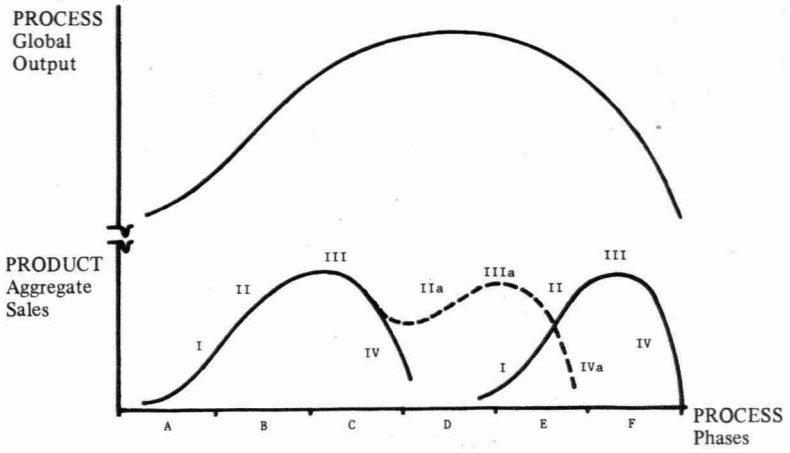
Table 2.– Process Innovation and the Entrepreneurial Roles

	Phases					
	A	B	C	D	E	F
R & D	Invention					
Finance		Investment	Investment			
Marketing		Strategic Planning				
Production					Coordination	Coordination
Interfirm/ Interindustry			Intermarket Connector	Intermarket Connector	Intermarket Connector	

A third phase of process innovation and development then involves investment as a crucial role in increasing the capacity and outreach of process activities and output (see Table 2). A need for greater vertical integration and coordination with suppliers and customers may also require intermarket connection to play a major innovative role during this and the fourth phase of process development. At the same time, during the third phase, significant diffusion of process knowhow can be expected to occur, first, to less developed export-oriented regional and national economies, especially in industries manufacturing consumer durables or involved in significant assembly of these products. This can only be expected to help small and medium size manufacturers in those areas, as they apply their comparative advantages in labor costs to vie for additional productive capacity. The rapid diffusion to, and development of, electronics manufacturing in several Asian nations and, particularly, South Korea, is a significant example of this phenomenon. It is significant to note the some of the larger firms in these nations actually started out as relatively small concerns that grew rapidly with government support and significant investment and strategic planning. Such diffusion can become more significant during the fourth phase for economies involved in significant import substitution, whether in capital goods or consumer durables manufacturing and, to some extent, in those natural resource-related industries where preliminary processing capabilities are being expanded. The industrialization and adoption of innovations in nations such as Brazil, Argentina and Mexico are major examples of this development.

The international diffusion of process knowhow during the fourth and fifth phases (D, E) of the process cycle has been a subject of much attention in recent years. Grunwald and Flamm (1985), for example, assign a very important role to labor costs in attracting assembly-type processes to less developed nations. Industries applying such processes are usually relatively small, by international standards. Cost advantages in this area must, however, be offset by any additional transport cost incurred in shipphing products to markets in the advanced nations. Nations with potentially large markets for any of these products, where

Figure 2.– Process and Product Cycles



substantially lower labor costs can offset any additional transport and transaction costs, can therefore enjoy a much more significant advantage than nations with smaller potential markets.

Intermarket connection can be expected to become a significant entrepreneurial role in the fifth phase of the process cycle, by promoting greater horizontal integration between a firm with an increasingly obsolecent productive process and other, usually smaller, service enterprises with certain medium term stability. This would most likely apply to industries facing significant competition, but may also affect oligopolized industries facing uncertain or highly competitive international markets. The most obvious manifestation of this development is the emergence of conglomerates and increasing rates of acquisitions and mergers involving various sectors. Increasing horizontal integration is also combined in many cases with substantial vertical integration, especially as the limits of the latter are reached, through either institutional or

functional constraints, and disintegration and subcontracting to smaller and medium size firms begin to develop.

Organizational problems in dealing with labor issues and endogenous-exogenous environmental pressures during the last two phases cycle then ensure a significant role for coordinative entrepreneurship. As with the product cycle, innovation in this role may be found in experimentation with organizational and workforce arrangements that attempt greater participacion of the workforce in the productive process, or substitute more machinery for labor. In the case o f relocations to lower wage nations or regions, a significant aspect of this role may therefore involve the substitution of less skilled for more skilled labor, or of labor for machinery, and the fragmentation of a production process into smaller units and firms.

The temporal dimensions of the product and process cycles also reflect differences that are inherent in the scale and complexity of their innovations (see Figure 2). Product differentiation and its added lease on the life of a commodity is a very common strategy in product development, especially in situations where no distinct or competitive substitute has emerged. In constrast, significant process differentiations have been very limited, historically, since whenever they are feasible, the investment required is generally substantial and their longevity is usually quite uncertain. At the same time, it is obvious that a single but perhaps slightly differentiated process can accommodate more than one product's life cycle and, in some cases, several parallel product lines and their differentiations. Differentiated processes can, as a whole, be expected to establish greater articulation with smaller and medium size industries, as larger firms discover the disadvantages of introducing substantial in-house modifications and capital investment.

V. Conclusions

This paper has related entrepreneurial innovation and its various roles to industrial firm size dynamics in the processes of economic development and manufacturing change. Special emphasis has been placed on the role of small and medium size industries in the analysis of these processes and their economic impacts. The approach adopted in this paper has been general in scope, and has stressed the interrelations that exist between entrepreneurial innovation and the development of small and medium size industries, at each stage of the long term processes of economic and industrial change.

Some of the entrepreneurial roles defined in this paper are more important in some stages of economic and industrial change than in

others. Thus, whenever any of the crucial roles are less available to smaller and medium size firms, it may be expected that major obstacles to firm growth and development may occur. The lack of institutionalized capital markets that can serve the needs of small and household firms can, for example, prevent the development of these enterprises whenever the entrepreneurial investment role becomes an essential component of any product or process development phase. Similarly, the lack of sufficient societal educational resources can hamper the advancement of small entrepreneurs whenever invention becomes a crucial element for advancement, as in the first phases of product and process innovation.

Such disparities in the supply of innovative entrepreneurial roles available to small and medium size firms and the temporal requirements of industrial and general economic progress can be expected to introduce significant bottlenecks in the process of regional and local economic development. The fact that these considerations have been so conspicuously missing from the development literature only reinforces our ignorance about the general processes of economic and social change.

It is hoped that the general analytical framework presented in this paper can provide a better understanding of the role of firm size and of small and medium size industries, in particular, in the long term processes of industrial and economic change. Hopefully, this effort may stimulate others to seek empirical evidence and to provide further analytical and conceptual insights on the processes outlined in this discussion.

REFERENCES

ABERNATHY, William J., and Peter L. Townsend.: "Technology, Productivity and Process Change". *Technological Forecasting and Social Change*, Vol. 7, 1975, pp. 379-396.

ANDERSON, Dennis.: "Small Industry in Developing Countries: A Discussion of Issues". *World Development*, Vol. 10, 1982, pp. 913-948.

BANERJI, Ranadev.: "Small Scale' Production Units in Manufacturing: An International Cross-Section Overview". *Weltwirtschaftliches Archiv*, Vol. 114, 1978, pp. 62-82.

BAUMOL, William, J.: "Entrepreneurship in Economic Theory". *The American Economic Review*, Papers and Proceedings, Vol. 58, 1968, pp. 64-71.

– – –: "Towards Operational Models of Entrepreneurship" In: Joshua Ronen (Ed.), *Entrepreneurship.* Lexington, Mass., 1983, pp. 29-48.

CHANDLER, Alfred D., and Herman DAEMS (Eds.): *Managerial Hierarchies: Comparative Perspectives on the Rise of the Modern Industrial Enterprise*. Cambridge, Mass., 1980.

– – –, and Fritz REDLICH: "Recent Developments in American Business Administration and their Conceptualization". *Business History Review*. Vol. 35, 1961, pp. 1-27.

GIERSCH, Herbert: "The Age of Schumpeter". *The American Economic Review*, Papers and Proceedings, Vol. 74, 1984, pp. 103-109.

GREENFIELD, Sidney M., and Arnold STRICKON; "A New Paradigm for the Study of Entrepreneurship and Social Change". *Economic Development and Cultural Change*, Vol. 29, 1981, pp. 467-499.

GRUNWALD, Joseph, and Kenneth FLAMM: *The Global Factory: Foreign Assembly in International Trade*. Washington, D.C., 1985.

Hansen, NILES M.: "The New International Division of Labor and Manufacturing Decentralization in the United States". *Review of Regional Studies*, Vol. 9, 1979, pp. 1-11.

HARBISON, Frederick H.: "Entrepreneurial Organization as a Factor in Economic Development". *Quarterly Journal of Economics*, Vol. 70, 1956, pp. 364-379.

HAYES, Robert, and Steven WHEELWRIGHT: "The Dynamics of Process-Product Life Cycles". *Harvard Business Review*, Vol. 57, 1979, pp. 127-136.

HIRSCH, Seev: *Location of Industry and International Competitiveness*. Oxford 1967.

HIRSCHMAN, Albert O.: *The Strategy of Economic Development.* New Haven 1958.

HOSELITZ, Bert F.: "Small Industry in Underdeveloped Countries". *Journal of Economic History*, Vol. 19, 1959.

JEWKES, John, David SAWERS, and Richard STILLERMAN: *The Sources of Invention.* 2nd edition, New York 1969.

KILBY, Peter: "Hunting the Heffalump" In: Peter Kilby (Ed.), *Entrepreneurship and Economic Development.* New York 1971, pp. 1-40.

LEIBENSTEIN, Harvey: "Entrepreneurship and Development". *The American Economic Review*, Vol. 58, 1968, pp. 72-83.

– – –, *General X-Efficiency Theory and Economic Development*. New York 1978.
– – –, "Entrepreneurship, Entrepreneurship Training, and Economics: The Case of the Missing Inputs". 1985, mimeo.
LIVINGSTONE, Ian (Ed.): *Development Economics and Policy: Readings*. London, 1980.
McCLELLAND, David, C.: *The Achieving Society*. Princeton 1961.
NELSON, Richard R.: "Competition, Innovation, Productivity Growth, and Public Policy". In: Herbert Giershc (Ed.): *Towards an Explanation of Economic Growth*. Symposium 1980, Tubingen 1981, pp. 151-179.
– – –, "Incentives for Entrepreneurship and Supporting Institutions". *Weltwirtschaftliches Archiv*, Vol. 120, 1984, pp. 646-661.
– – –, and Sydney G. Winter: *An Evolutionary Theory of Economic Change*. Cambridge, Mass., 1982.
NORCLIFFE, G.B. and D.B. FREEMAN: "Non-Farm Activities in Market Centers of Central Province, Kenya". *Canadian Journal of African Studies*, Vol. 14, 1980, pp. 503-517.
PARKER, W.N.: "Industry". In: Peter Burke (Ed.), *The New Cambridge Modern History*. London, 1979.
REDLICH, Fritz: "Toward the Understanding of an Unfortunate Legacy". *Kyklos*, Vol. 19, 1966, pp. 709-716.
SCHUMPETER, Joseph A.: *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Cambridge, Mass., 1934. (Originally published as *Theorie der Wirtshcaftlichen Entwicklung*, Leipzig 1912).
SOLOW, Robert M.: "Technological Change and the Aggregate Production Function". *Review of Economics and Statistics*, Vol. 39, 1957, pp. 312-330.
STALEY, E. and R. MORSE: *Modern Small-Scale Industry for Developing Countries*. New York, 1965.
SUAREZ-VILLA, Luis: "El Ciclo del Proceso Manufacturero y la Industrialización de la Frontera Mexicano-Norteamericana". *El Trimestre Económico*, Vol. 51, 1984, pp. 287-312.
SUAREZ-VILLA, Luis: "Los Enclaves Industriales para la Exportación y el Cambio en las Manufacturas". *Comercio Exterior*, Vol. 35, 1985, pp. 466-480.
SUAREZ-VILLA, Luis: "A Gestao Empresarial e a Difusao Internacional de Inovaçoes na Manufatura: Uma Perspectiva Geral". *Revista Brasileira de Economia*, Vol. 40, 1986, in press.
Thomas, MORGAN, D.: "Growth Pole Theory, Technological Change and Regional Economic Growth". *Paper of the Regional Science Association*, Vol. 34, 1975, pp. 3-25.
VERNON, Raymond: "International Investment and International Trade in the Product Cycle". *Quarterly Journal of Economics*, Vol. 80, 1966, pp. 190-207.
– – –, "The Location of Economic Activity". In: John Dunning (Ed.), *Economic Analysis and Multinational Enterprise*. London 1970, pp. 89-114.